Layers	Height
1	$r + r$
2	$r + \sqrt{3}r + r$
3	$r + \sqrt{3}r + \sqrt{3}r + r$
.	.
.	.
10	$r + 9(\sqrt{3}r) + r$
.	.
.	.
n	$r + (n-1)(\sqrt{3}r) + r$

Numbers

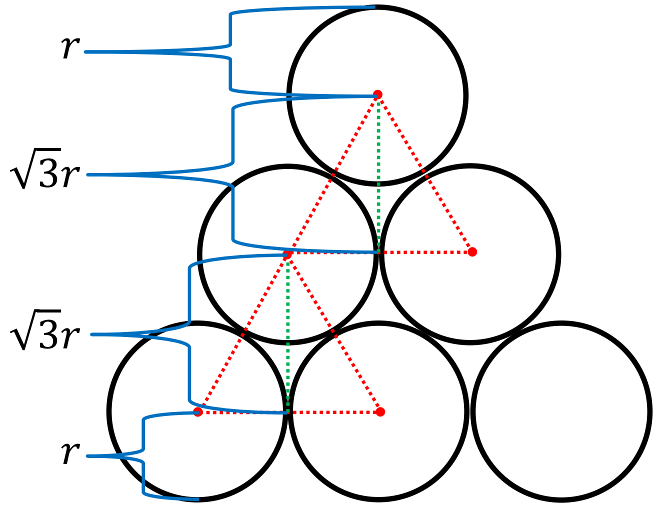

Illustration of 3 layers' height

Pictures

$$h = r + (n-1)(\sqrt{3}r) + r$$

h = height of staggered pipes
r = radii at the bottom and top of stack
n = number of layers
$\sqrt{3}r$ = height between pipes' centers

Symbols

To find the height of the staggered pipe stack, I drew three layers of pipes. I didn't know the pipes' radius so I left it as r. I noticed that connecting the pipes' centers formed equilateral triangles. I then drew a line to represent the triangle's height and used the Pythagorean Theorem to find $\sqrt{3}r$ as the vertical distance between the pipes' centers. I noticed that every time I added another layer, it added another $\sqrt{3}r$ to the total height but that there was always the same two r at the top and bottom of the stack. I realized that the quantity of $\sqrt{3}r$ was always one less than the total number of layers, as shown in my picture. So, I ended up with the formula below which works for any pipes of any radius.

$$h = r + (n-1)(\sqrt{3}r) + r$$

Words